

Radiologic Evaluation of the Neck: A Review of Radiography, Ultrasonography, Computed Tomography, Magnetic Resonance Imaging, and Other Imaging Modalities for Neck Pain

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KEYWORDS

• Neck pain • Diagnostic imaging • Spine • Radiology

The patient with neck pain may pose a diagnostic dilemma for the treating physician. As with other areas of medicine, imaging is guided by the history and physical examination. The steady advance of 3-dimensional, functional, and nuclear medicine studies make it increasingly important that the ordering physician be aware of the potential benefits and disadvantages of imaging options. This article reviews the current literature on imaging for the patient with neck pain, illustrates several imaging abnormalities, and discusses the workup of commonly seen patient populations.

PLAIN RADIOGRAPHY

Plain radiography of the cervical spine has certain advantages over more advanced imaging techniques. Imaging is inexpensive, quick, and easy to perform, and exposes

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the patient to significantly less radiation than computed tomographic (CT) scans. However, radiographs are insensitive to many disorders of the cervical spine, and these disorders may require adjuvant advanced imaging confirmation.

In patients without a history of trauma, plain radiographs are often ordered for the workup of neck pain or radicular upper extremity pain. However, in those with nonspecific neck pain, plain radiographs are unlikely to be helpful in the diagnosis.¹ The history should alert the clinician regarding when further workup and imaging will be necessary. Red flags initially described for acute low back pain can be used in the assessment of patients with neck pain.¹ These red flags include age of onset less than 20 years or greater than 55 years, constitutional symptoms, history of cancer, immunosuppression, and drug abuse.² Evaluation may include laboratory work as well as plain radiographs. Early disease may be missed, and normal results of radiographs should not preclude further workup.

Plain radiographs and advanced imaging may also be obtained for patients with chronic neck pain who have failed a trial of conservative care or for patients with neurologic signs of radiculopathy.² The American College of Radiology has developed a set of criteria for the appropriate use of imaging in patients with chronic neck pain.³ Plain radiographs may not need to be obtained if further imaging with either CT or magnetic resonance imaging (MRI) is pursued. In these cases, a plain radiograph is unlikely to add diagnostic value or alter the management plan.

Routine anteroposterior (AP) and lateral views may show loss of vertebral disk space height, facet arthropathy, spondylolisthesis, malalignment, fracture, and congenital osseous abnormalities. Oblique views are often ordered to evaluate the foramen, but this is highly dependent on patient positioning. The findings are more conclusive with CT and MRI. Flexion-extension views may be added to evaluate for instability, particularly if a spondylolisthesis is found on lateral views. Greater than 3.5 mm of translational displacement or 20° of angular motion is significant and indicates instability.⁴ Dynamic views are also obtained if the patient has a history of prior surgical fusion, rheumatoid arthritis (RA), down syndrome (DS), or other known cervical diseases. These views need not be ordered routinely in the absence of any of the above-mentioned conditions. A recent study indicates that in patients with no history of cervical spine abnormality, flexion-extension views do not alter the clinical management of patients, even in the presence of instability, because decisions to operate are based on symptoms rather than imaging results. These views are, however, helpful in surgical planning.⁵ The open-mouth odontoid view is needed if there is a history of trauma, or in the presence of disorders that affect the atlantooccipital junction. Indications for more advanced imaging include any concern for infection or malignancy, such as constitutional symptoms, immunocompromise, or history of cancer. Neurologic impairment on examination should prompt more advanced imaging.² Examples of the normal cervical radiographs can be found in **Fig. 1**.

RADIOLOGY IN TRAUMA PATIENTS

In the patient with blunt trauma, clearing the cervical spine efficiently and accurately is a priority. The National Emergency X-Radiography Utilization Study (NEXUS) criteria were developed to stratify patients into low- and higher-risk groups. These criteria include the absence of all of the following conditions: midline cervical tenderness, altered level of consciousness or intoxication, abnormal neurologic findings, or painful distracting injuries (**Box 1**). Patients who meet all the NEXUS criteria are classified as low-risk patients and may be cleared on the basis of history and physical examination

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